

DISCUSSION OF THE AMENDMENT

The specification is amended in the Abstract for matters of form.

Claims 1-15 are pending in the application. Claims 8-15 are new claims. Support for new Claim 8 is found in original Claim 1. Support for new Claims 9-12 is found in Tables 1 and 2. Support for new Claims 13-15 is found on page 16.

No new matter is added.

REMARKS/ARGUMENTS

Applicants demonstrate in the examples of the specification that the inclusion of vinylene carbonate as a non-aqueous solvent material in an electrolytic solution of a lithium ion capacitor provides a capacitor having substantially improved durability and long term performance. Table 1 on page 40 of the specification describes a series of six inventive and three comparative examples. The main difference in the inventive and comparative examples is the inclusion or exclusion of vinylene carbonate as a non-aqueous solvent component. Table 1 is reproduced below for convenience.

TABLE 1

<u>Initial capacitance and energy density</u>					
	Solvent	Solute	VC content (wt %)	Initial capacitance (F)	Energy density (Wh/l)
Ex. 1	3EC + 4DEC + PC	LiPF ₆	1	29.7	12.1
Ex. 2	3EC + 4DEC + PC	LiPF ₆	3	29.3	11.9
Ex. 3	3EC + 4DEC + PC	LiPF ₆	0.1	31.5	12.6
Ex. 4	3EC + 4DEC + PC	LiPF ₆	0.5	29.6	12.0
Ex. 5	2EC + 3MEC	LiPF ₆	1	29.9	12.1
Ex. 6	3EC + 4DEC + PC	LiN(C ₂ F ₅ SO ₂) ₂	1	28.3	11.4
Comp. Ex. 1	3EC + 4DEC + PC	LiPF ₆	—	30.6	12.3
Comp. Ex. 2	2EC + 3MEC	LiPF ₆	—	30.8	12.4
Comp. Ex. 3	3EC + 4DEC + PC	LiN(C ₂ F ₅ SO ₂) ₂	—	29.2	11.8

Table 2 on page 41 of the specification describes the capacity retention performance of the lithium ion capacitors of Table 1. It is readily evident from the results in Table 2 that the inventive lithium ion capacitors exhibit substantially improved capacity retention in comparison to lithium ion capacitors that do not include vinylene carbonate. After undergoing voltage application for 1,010 hours the inventive examples have a capacity

retention of no less than 93.3%. This compares with a maximum capacity retention of 91.6% for Comparative Example 1 (see Table 2 below).

TABLE 2

Capacity retention after a lapse of 1,010 hours after voltage application				
	Solvent	Solute	VC content (wt %)	Capacity retention
Ex. 1	3EC + 4DEC + PC	LiPF ₆	1	95.9%
Ex. 2	3EC + 4DEC + PC	LiPF ₆	3	94.3%
Ex. 3	3EC + 4DEC + PC	LiPF ₆	0.1	93.3%
Ex. 4	3EC + 4DEC + PC	LiPF ₆	0.5	95.1%
Ex. 5	2EC + 3MEC	LiPF ₆	1	93.5%
Ex. 6	3EC + 4DEC + PC	LiN(C ₂ F ₅ SO ₂) ₂	1	93.3%
Comp. Ex. 1	3EC + 4DEC + PC	LiPF ₆	—	91.9%
Comp. Ex. 2	2EC + 3MEC	LiPF ₆	—	89.6%
Comp. Ex. 3	3EC + 4DEC + PC	LiN(C ₂ F ₅ SO ₂) ₂	—	89.4%

Applicants submit that it is readily evident to those of skill in the art that the improvement shown for the inventive capacitors is substantial because batteries must be able to provide a long lifetime without substantial reduction in capacity retention in order to be economically feasible and commercially useful.

Applicants submit that it is readily evident that the examples of the original specification provide a side-by-side comparison of the claimed invention (i.e., a lithium ion capacitor having a vinylene carbonate-containing electrolytic solution) with a corresponding lithium ion capacitor that is the same as the inventive examples except for the exclusion of vinylene carbonate as a component of the electrolytic solution. Applicants submit that the

evidence of the original specification proves the criticality of vinylene carbonate with respect to providing substantially improved capacity retention.

The Office rejected the claims as obvious over the combination of Ando (U.S. 6,862,168)¹ and Sonoda (U.S. 2002/0028389). The Office acknowledges that Ando is silent with respect to a lithium ion capacitor that includes an electrolytic solution comprising vinylene carbonate. The Office relies on Sonoda to cure this deficiency of Ando.

In particular, the Office asserts that it would be obvious to include vinylene carbonate in the electrolytic solution of Ando because Sonoda discloses that vinylene carbonate may be included as a non-aqueous solvent component in electrolytic solutions. In essence, the Office asserts that it would be obvious to include any of the non-aqueous solvents disclosed in Sonoda in the capacitor of Ando. *Arguendo*, if the Office's logic were correct, one of ordinary skill in the art would expect that the resulting capacitors would have the same properties, e.g., because of the asserted equivalence of the non-aqueous Sonoda solvents.

Applicants' examples of the original specification rebut the Office's assertion of obviousness. Applicants have shown that the inclusion of a particular non-aqueous solvent (i.e., vinylene carbonate) provides a lithium ion capacitor that is substantially improved with respect to properties such as capacity retention. Applicants' examples demonstrate the criticality of including vinylene carbonate as a component in the lithium ion capacitor. Nothing in the art relied on by the Office discloses or suggests that such improved capacity retention may be obtained by including vinylene carbonate in an electrolytic solution.

Applicants submit the data of the original specification rebuts the Office's assertion of obviousness and thus all now-pending claims should be allowed.

¹ The Office cited WO 03/003395 in reference to Ando. Applicants note that the International Application was published in the Japanese language. Applicants rely on the disclosure of U.S. 6,862,168 which, to Applicants' knowledge, corresponds with the disclosure of WO 03/003395.

Applicants draw the Office's attention to new dependent Claims 8-15 which are drawn to particular embodiments of the invention. New dependent Claim 12 recites a particular capacity retention demonstrated by the capacitors of the examples disclosed in the specification.

For the reasons discussed above in detail, Applicants submit that withdrawal of the rejection and allowance of all now-pending claims is appropriate.

Applicants thank Examiner Thomas for the helpful and courteous discussion of November 16, 2009. During the discussion, Applicants' U.S. representative explained that the examples of the specification show the criticality of the inclusion of vinylene carbonate to a lithium ion capacitor with respect to achieving improved capacity retention. The Examiner appeared to be in agreement that such a showing may effectively rebut the rejection under 35 U.S.C. §103.

Respectfully submitted,

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